

Incorporating
"The
Illuminating
Engineer."

Light and Lighting

Official Journal
of the
Illuminating
Engineering
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Edited by J. STEWART DOW

Telephone:
ABBey 5215.

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I Remember . . .

THERE is Magic in Memory. A snatch of an old tune and we are reminded of some enjoyable incident of the past—the scent of flowers in the evening, of new mown hay or of rain on sun-baked earth, and we are transported for an instant into childhood—when the world was fresh and marvellous.

During such a period as this, with the present beset by anxieties, and the future uncertain, there is relief and comfort in recalling the experiences and achievements of the past.

This month (see p.24) members of the Illuminating Engineering Society spent a pleasant evening dipping into their recollections, in the case of many going back thirty or more years ago, when the Society was about to be formed—and in the case of Mr. Trotter as far as fifty years ago, when he was already in the thick of problems which we have been considering ever since.

Reminiscences roved over a wide field. The evolution of measuring instruments, the utilisation of the services of members of the Society in the Great War, the building up of an international understanding in regard to standards of light were amongst the topics discussed.

Altogether a Wonderful Record of Achievement during the past Thirty Years!





Legislation on Factory Lighting

It would be a pity if, during the war period, the constructive work embodied in the Fourth Report of the Departmental Committee on Lighting in Factories should entirely pass out of mind. We therefore welcome the account before us of a discussion on this topic arranged by the I.E.S. North Midland Centre on January 8. Mr. F. Baker, in opening the discussion, took the viewpoint of a manufacturer of woollen goods who contended that his lighting was already adequate and that some of the new clauses were irksome. Mr. A. E. Iliffe, as a lighting man, expressed appreciation of the attitude of the Government and of the work of the committee, and Mr. R. W. Daniel quoted from his own experience as a factory inspector to show the need for improvements—which had been accentuated by advances in the lighting of streets, shops, and homes within recent years. Members present, about forty-five in number, enjoyed the discussion, after which the chairman (Mr. J. W. Howell) conveyed the thanks of the Centre to Mr. Iliffe and Mr. Daniel, who had come up to Leeds for the meeting.

Street Accidents by Day and by Night

One of the most significant features of the grave increase in the figures for street accidents is the rising proportion of night fatalities. Attention has been drawn in the past to the tendency for the ratio of night accidents to day accidents to rise progressively. From figures quoted for the Metropolitan area by Mr. L. Gaster, the ratio in 1913 would seem to have been about 17 per cent. Ten years later Sir Park Goff, in the House of Commons, showed that the ratio had risen from 29 per cent. in 1920 to 46 per cent. in 1926. The figure derived from statistics of the National Safety First Association in 1933 was 54 per cent. This progressive increase did not, of course, mean that street lighting was becoming continually worse—it was actually improving (except for the interval of the Great War) steadily, though rather slowly, during this period—but was an inevitable result of the tendency for more use to be made of the roads for motor traffic in the night time. The tendency has, however, been completely overshadowed by what has occurred during the black-out. It is stated, for instance, that there were last year 160 fatalities in London, as compared with 102 in 1938—even though there were only four months of black-out included. Of the reported fatalities by far the greater proportion, 122, took place during the hours of darkness. The ratio of night to day accidents has thus become 500 per cent., a staggering change considering the general diminution in both vehicular and pedestrian traffic by night, yet one that is likely to become even more marked during a complete year of black-out.

A.R.P. Lighting Exhibition

The exhibition, which has been assembled at the Building Centre and which was officially opened on February 2, contains an excellent variety of lighting, heating, and ventilating devices of interest in connection with A.R.P. Whilst the exhibits are naturally in the main familiar to those who have been devoting concentrated attention to these problems during recent months, it is most helpful to have them thus assembled together, whilst to many others the progress that has been made will come as a revelation. In many cases, notably in connection with the street lighting fittings, light locks and A.R.P. signs for shelters, etc., the features embodied in B.S.I. specifications are very well brought out. There are also useful blacking-out devices and an exhibition of fluorescent effects which is highly effective. In the absence of the Earl of Lytton (President of the British Electrical Development Association) his introductory address was read by Lady Lytton. Subsequently Sir John Anderson paid a tribute to the skill and industry of those responsible for the production of the devices on view. He crystallised the essentials of scientific screening by urging people to black out but not to "black in"—in other words to screen so effectually that the gloom outside can be completely banished once one is inside the building. A presentation to Sir John Anderson, made by Mrs. Earle, included a walking stick with a flash-light near the ferrule. In the course of some final remarks the Chairman of the Association (Mr. A. Nichols Moore) thanked Sir John Anderson for his visit, after which those present were free to wander round and inspect. We certainly advise any readers who have not yet seen the exhibition to pay it a visit.

War Time Street Lighting Units

The specification relating to Street Lighting Under War Time Conditions (BS/ARP 37) is rather an exacting one. It is satisfactory to note that about half a dozen firms have already been granted the necessary B.S.I. mark, and additions are being constantly made to the number. It is thus becoming continually easier to meet the demands of local authorities. In the original specification the limits between polar curves of light distribution were extremely narrow. Experience has shown that a little relaxation might be permitted, notably in the case of the 10 ft. and 20 ft. units. These have been promptly introduced into the latest revised version of the specification (January, 1940), which also contains the promised supplementary diagram for units of 10 ft. nominal mounting height but spacings of 50 to 100 ft. only.

Lighting Restrictions

In what follows we summarise the chief changes and additions introduced by the Emergency Powers (Defence) Order No. 74, 1940, which (with certain reservations) came into force on the 1st of this month.

It will be recalled that we gave a summary of the chief requirements of the previous Lighting Restrictions Order (No. 1098, 1939) in the issue of "Light and Lighting" for October, 1939.

For this the present revised and extended order is now substituted. The new order occupies more than three times the space of the previous one. Many of the old clauses are extended and certain new matter, based largely on B.S.I. specifications, is introduced.

The general conditions in Part I., requiring the screening of all lights by night remain, with certain formal reservations in regard to the display of light by His Majesty's Forces, etc., substantially the same. In Part II. new matter is introduced in connection with Public Roads.

PUBLIC ROADS.

The regulations in regard to traffic signs, and the use of lights on bollards on refuges remain substantially unaltered, but the use of lights in the form of a hooded cross, having an average brightness of 0.5 candles per sq. foot, to mark refuges and the circumference of roundabouts is now permitted. Red lights (not exceeding 1 c.p.) so screened as to prevent light being thrown upwards or any appreciable illumination being cast on the ground—may be used to indicate obstructions or excavations in the road.

An important paragraph (Clause 7) permits lights complying with BS/ARP 37 and fittings marked with the corresponding B.S.I. mark to be installed for the lighting of any road, except in such areas as may be specified by the Minister of Home Security. (A reproduction of the B.S.I. mark appears at the end of the Order, where it is laid down that the mark must be used with the Licensee's name or trade mark, or the number of his licence; also that lighting fittings bearing the mark must also be marked with an indication of the nominal mounting height and the size of lamp or mantle.)

Clause 8 empowers any local authority to provide flares during a fog, provided permission has been given by the chief officer of police and provision has been made for extinguishing the flares in the event of a raid warning.

ROAD VEHICLES.

This section has become somewhat complex.

The requirements for "an authorised side lamp" in substance resemble those previously given for all vehicle lamps of a power not exceeding 7 watts but are somewhat condensed. The requirements for "an authorised head lamp," of a power exceeding 7 watts, are based on the use of a mask, ensuring that (a) no light reaches the ground at any point nearer than 10 ft. from the lamp or five times the height of the bottom of the lamp above ground level, whichever is the less, (b) no light is projected above the horizontal when the vehicle is standing on a level surface, (c) the light emitted is diffused by the insertion in the mask of a screen of some diffusing material, (d) the illumination on a vertical

surface at any point 10 ft. from the lamp does not exceed 2.5 ft.c., and (e) no light is emitted except through the mask.

There are also conditions relating to "dual purpose lamps" (the power of which may or may not exceed 7 watts at the option of the driver) and there are general provisions relating to vehicles in general such as the requirement of a special "fog lamp," operated by a separate switch, and that lights must be extinguished on receipt of an air-warning.

The above conditions apply, with modifications, to public service vehicles, tramcars, etc., for which there are also revised conditions in regard to interior lighting. The original very dim lighting (not more than 0.006 ft.c. 4 ft. from the lamp) is now improved upon. The illumination at seat level may attain up to 0.1 ft.c. No part of a bulb through which light is allowed to pass must be visible outside the vehicle, and the illumination at ground level outside the vehicle is not to exceed 0.001 ft.c.

There are numerous supplementary rules relating to cycles, horse-drawn vehicles, taximeter cabs, and animals which (with the exception of horses being ridden or drawing a vehicle, and fowls, dogs, and cats) must not be led, driven, or conducted without the display of lights.

SHOPS, STALLS, HOTELS, AND PLACES OF ENTERTAINMENT.

The requirements in regard to signs, the brightness of which must not exceed 0.02 equivalent ft.c., are those recently announced and reported in this journal, and the same applies to the conditions in regard to the display of light in shop windows, by special fittings or cabinets in accordance with BS/ARP 35 (see "Light and Lighting" Dec., 1939, pp. 248, 256).

The requirements in regard to stalls are notably simpler. On stalls on a road or in an uncovered market light may be displayed so long as (a) the stall is completely covered in with light-proof material on all sides but one, (b) only one source of light, not directly visible from outside the stall, is used, (c) no more light is displayed than is sufficient to enable the goods on the stall to be seen by customers and, (d) the light is displayed only when the stall is open for business.

RAILWAYS, DOCKS, WATERWAYS, ETC.

The requirements in regard to docks and railways in general resemble those in the previous orders. An illumination not exceeding 0.002 ft.c. is here permitted. There is, however, still no mention of its being permitted for other outside areas devoted to essential work, though it is understood that in such cases permission may be secured from the local chief officer of police.

The restriction in regard to the internal lighting of railway carriages (abandoned in the case of public vehicles) to 0.006 ft.c. 5 ft. from the lamp remains, but a saving clause permitting other methods in accordance with a scheme approved by the Ministry of Home Security is inserted.

USE OF TORCHES.

The display of light from torches is now recognised, provided (a) the torch complies with BS/ARP 3 or (b) the light is dimmed by two sheets of tissue paper or their equivalent, and also provided the light is white, is at all times directed downwards, and is extinguished on receipt of an air-raid warning.

(This last requirement, clearly indicating that hand lamps and torches are not expected to be used by the public whilst air-raids are in progress, only serves to emphasise the value of the permanent wartime street lighting now being introduced.)

Gauges for Checking Low Values of Illumination

(0.0002 to 0.2 foot-candle)

In what follows we give a summary of the above specification (BS/ARP 30) which forms one of a series prepared under the aegis of a Joint Committee of the Illuminating Engineering Society and the Ministry of Home Security (A.R.P. Dept.) and is issued by the British Standards Institution at the request of that Department.

The specification breaks new ground, firstly in providing facilities for testing very low illuminations—right down to the extremely low level of war time street lighting—and secondly in providing a simple "gauge," registering by inspection, in place of a photometric instrument.

This specification summarises the conditions to be fulfilled by "photometric gauges," of which specimens have already been shown to members of the Illuminating Engineering Society. These gauges differ from the ordinary form of visual photometer. There is no manipulation to achieve a balance corresponding to the indication of a pointer somewhere on a scale of values of illumination. The gauges are only intended to give a clear visual indication when a specified illumination of a low order is exceeded. Means may be provided to enable more than one value of illumination to be gauged by the same instrument, but in each case the instrument must be set and clamped at the point to be examined and the indication is, like a signal, on the "stop or go" principle. The gauges are only intended for checking low values of illumination (0.0002 to 0.2 ft.c.). It is recommended that when the illumination exceeds 0.2 ft.c. use should be made of illumination photometers of the ordinary type that enable illumination to be measured in the customary manner. The only values of illumination marked on the gauge are those nominal values for which it is intended to serve.

ESSENTIAL FEATURES.

A series of clauses indicate essential features of design. The gauge is to be provided with a detachable test plate with a permanent matt white surface, on which the illumination under test is received. The photometric field of view shall not subtend less than 5° or more than 10° at the observer's eye, and the diameter of the aperture in the eyepiece shall not be less than 7 mm. As a check on accuracy it is prescribed that the mean of the two illuminations on the test plate surface when the field of view just goes out of balance in each of the two directions respectively shall be within 20 per cent. of the specified value of illumination.

Any precautions to be observed in testing coloured light should be clearly stated by the manufacturer, preferably on the instrument. It should be possible to use the instrument without recourse to any external illumination beyond that furnished by the instrument or the installation under observation. The gauge must be readily portable and must be marked with (a) the nominal illumination, (b) a serial number, and (c) the maker's name or trade mark.

BASIS OF CALIBRATION.

An important feature is the arrangement for calibration of apparatus intended for these very low illuminations. The gauge is to be capable of *checking* one or more of the values given in column 1 of Table I. But in order to afford an unmistakable indication and at the same time to permit reasonable tolerance, the instrument is to be *adjusted* to the values given in column 2. (A gauge so adjusted is strictly a limit gauge, full allowance having been made for all the tolerances permissible both in the instrument itself and in the lighting installation. No further allowance is necessary.)

TABLE I.

NOMINAL VALUE.	CALIBRATION VALUE.
0.0002 ft.-c.	0.0003 ft.-c.
0.002 "	0.003 "
0.02 "	0.03 "
0.2 "	0.3 "

BRIGHTNESS OF PHOTOMETRIC FIELD.

A further clause is intended to ensure that measurements are made at the greatest practicable brightness of the field of view—obviously desirable in view of the difficulty in making observations at such a low order of brightness. It is, therefore, stated in the specification that when the gauge is set for checking an illumination equal to or greater than 0.002 ft.c. (nominal) the brightness of the field of view shall not be less than that of the test plate when the illumination of the latter is 0.003 ft.c. (actual). When the gauge is set for checking a value of illumination below 0.002 ft.c. (nominal) the brightness of the field of view shall be not less than that of the test-plate. In this connection the effect of a colour-matching filter and/or sheets of clear glass in reducing the apparent brightness of the test plate as viewed through the gauge may be disregarded so long as the overall transmission factor of the media is not less than 20 per cent.

TYPES OF GAUGES.

An Appendix to the Specification contains notes on gauges and on their use for checking low values of illumination.

Amongst possible sources of light are mentioned (a) luminous (radium) paint in conjunction with a colour filter, and (b) a glow lamp fed from a dry cell and controlled by a rheostat and voltmeter—or, alternatively, fed by an unspillable secondary cell of which the voltage remains reasonably constant during discharge.

PRECAUTIONS IN USE.

Attention is drawn to the importance of ensuring that the eyes of observers are properly dark adapted. Generally, a period of at least fifteen to twenty minutes should be spent in surroundings where the illumination nowhere much exceeds that to be checked before tests are made. Exposure of the eyes, even for a short period, to any light source or bright surface must be followed by a further period of adaptation.

It is also pointed out that the illumination due to the light of the full moon is about 0.03 ft.c., and that due to starlight on a clear moonless night about one hundredth of this. Outdoor artificial illumination of a very low value can therefore only be gauged on a dark night on which there is no appreciable moonlight or starlight, unless it is possible by screening or otherwise, to prevent this light from reaching the test plate.



PHOTOMETERS

OF ALL TYPES

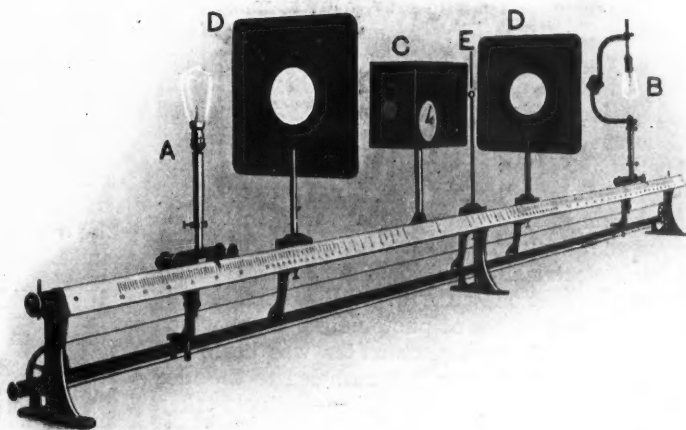
EVERETT EDGCUMBE make a complete range of Photometers for every kind of light measurement including A.R.P. lighting

● **CUBE PHOTOMETERS** for lamp testing in bulk with ease and rapidity. Essential to lamp manufacturers, factors, Illuminating Engineers, and users of lamps in large quantities. An unique compensating device for obscuration enables the efficiency of complete fittings to be tested.

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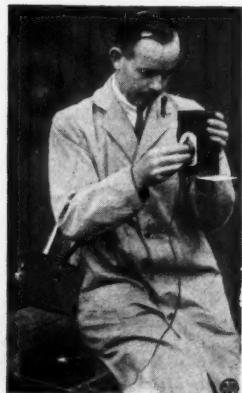
● **STANDARD (Direct Visual Reading) PHOTOMETER BENCH** for reference to fundamental standards and calibration of direct reading photometers, light meters and standard lamps.

● **POLAR CO-ORDINATE OR DIRECTIONAL PHOTOMETERS** for measuring distribution of luminous flux of lamps and the efficiency of lanterns and fittings.



● **THE A.R.P. PHOTOMETER** enables illumination at extremely low A.R.P. ("black-out") values to be directly measured.

● **THE A.R.P. ILLUMINATION GAUGE** complies with the latest B.S.I. (A.R.P.) Specification for Gauges for checking "black-out" illumination.



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Photometric Reminiscences

An account of an informal I.E.S.
meeting held at St. Ermin's Restaurant,
Westminster, on February 13.

The I.E.S. informal meeting, devoted to "Photometric Reminiscences," on February 13, was definitely a success—just the kind of informative and yet not too serious meeting that is acceptable in these times. There was no lack of reminiscences, both on the part of the "comparatively aged" and from some of the comparatively young—indeed, it was evident that some of the speakers could have contributed a great deal more had time allowed. As it was the meeting, which commenced with light refreshments at 6 p.m., did not terminate until nearly 9 p.m.

The Society was very fortunate, considering the claims of special war duties on so many of its leading members, to have present so many recognised experts on photometry. The only regret was that the "reminiscencer" with the longest memory of all, Mr. A. P. Trotter, was unable to make the journey to London.

Many of those who spoke referred to incidents in the years immediately preceding the formation of the Illuminating Engineering Society, a little more than thirty years ago. But Mr. Trotter's communication, which was read in abstract at the commencement of the proceedings, went much further than this, and touched on events half a century old. It commenced in 1878 when arc lamps and "Jablochkoff candles" were being used for street lighting (and even in factories). In the following year Mr. Trotter started on his researches on prismatic glassware. In 1881 he witnessed the display of the first incandescent lamps at the Paris electrical exhibition. Very shortly afterwards, in conjunction with Sir William Preece, he developed several forms of photometers from which the original illumination photometer was born. In 1895 a query by Mr. Roger T. Smith led to the idea of daylight measurements—afterwards actively taken up by Mr. P. J. Waldram. Other researches mentioned by Mr. Trotter were those undertaken by him into "artificial daylight" (1894) and tests of the gloss on paper, for which again a special instrument was devised (1914-15).

Dr. C. C. Paterson, who was called upon to open the subsequent chain of reminiscences, gave a most interesting account of early work on standards of light, the photometry of motor car headlights, and other researches at the National Physical Laboratory. He also traced, with a familiarity probably unattainable by anyone else in this country, the development of international understanding in regard to units of light, a process that must have involved endless patience and perseverance.

Later Mr. W. J. A. Butterfield explained the imperfections of the wax candle as a standard and contributed a summary of the development of flame standards, which played such an important part in early accurate photometry, notably in the gas industry. In the course of his address he threw on the

screen pictures of a number of rare prints, including portraits of early celebrities. Mr. P. J. Waldram reviewed the evolution of daylight photometry describing the early modification of the Trotter photometer with its cardboard attachment (the "coffee-pot") with which tests of daylight were first made in buildings and the idea of the "daylight factor" gradually took substance. He pointed out as a remarkable fact the sensitiveness of the eye to daylight ratios, which had enabled the value of 0.2 per cent to become the recognised one and to hold its position for over thirty years.

Colonel Kenelm Edgcumbe, likewise one of those who were associated with illumination photometry in its very early stages, mentioned Mr. Trotter's classic paper on "The Design and Measurement of Illumination," read before the Institution of Civil Engineers in 1892, as a most remarkable one to have been written nearly fifty years ago. Mr. (later Sir William) Preece, who had in 1883 developed a true illumination photometer, joined in the discussion. It was at this time that Mr. Trotter's "candle-foot" became established as a unit, and Mr. Trotter took up the design of the illumination photometer and introduced several important improvements which are found in some of the chief instruments to-day. Equally remarkable, at such an early date, was Mr. Trotter's recognition of 0.03 foot-candle as the minimum in a well-lit street and his statement that a spacing height ratio of four to one should not be exceeded in important ones. Colonel Edgcumbe showed an illustration of the first photometer, produced in 1903, for which he had been responsible and pointed out how it included features accepted to-day but disputed by the orthodox forty years ago.

Amongst others who spoke were Dr. J. W. T. Walsh, who also narrated early experiences at the N.P.L., Mr. E. Stroud, who exhibited a specimen of the original illumination photometer devised by Dow and Mackinney (now decidedly an oddity!), and Mr. G. H. Wilson, who illustrated an early treadmill-like apparatus for taking polar curves—of a kind to appeal to the budding mountaineer.

Mr. J. S. Dow showed an unusual form of photometer contrived for the purpose of measuring the high but fluctuating candlepower of star shells during the Great War. He pointed out, as a curious circumstance, that the two photometric researches then undertaken dealt respectively with extremes of brightness—represented by star shells (yielding up to 500,000 candle) and luminous gun sights (as low as 1/100,000th candle).

The Chairman (Mr. F. C. Smith) recalled some encounters with Mr. Winston Churchill, Mr. Lloyd George, and other celebrities, and amusing photometric experiences were contributed by Mr. G. H. Wilson ("cats"), Mr. A. E. Schuil ("buses"), Mr. W. A. Stevens ("bedroom photometry"), and Mr. C. A. Morton ("floodlighting Buckingham Palace").

An interesting final event was the display, by Mr. A. W. Beuttell, of the original binocular apparatus with which he had embarked on the study of subjective brightness. This was capped by Mr. K. J. W. Craik, of Cambridge University, who exhibited the latest approved instrument of this type—which is expected to prove quite a serviceable weapon.



BTH A.R.P. STREET LIGHTING LANTERN

Designed in the BTH Research Laboratories at Rugby and bearing the certification mark of the British Standards Institution.



The BTH Company, following the official pronouncement that a restricted form of street lighting would be permitted, have produced an inexpensive but thoroughly efficient lantern complying in all respects with the British Standard Specification BS/A.R.P. 37.

The die-cast parts used in the construction of the BTH A.R.P. Street Lighting Lantern ensure maintenance of initial performance and also obviate derangement or distortion due to rough handling.

Access can readily be obtained to every optical component, and no adjustments are necessary either during initial installation or when lamps are replaced, to allow for normal tolerances in light centre length of lamps.

Particular attention has been given to the need for providing fixing arrangements which will allow quick conversion of existing installations and three methods of support have been designed.

1. Top caps tapped $\frac{3}{4}$ ", 1" or $1\frac{1}{4}$ " BSP thread for screwing direct to the bracket arms.
2. Mechanical suspension devices for holding the A.R.P. Lantern rigidly into existing lanterns together with flexible electrical connectors to plug into the existing lamp sockets.
3. Rigid electrical connectors to support the A.R.P. Lantern from existing lamp sockets.

FOR FULL PARTICULARS AND PRICES OF THE BTH STREET LIGHTING LANTERN AND COMPONENTS WRITE FOR LEAFLET L692a/M.

BTH STREET LIGHTING ENGINEERS WILL BE PLEASED TO ADVISE ON ANY PROBLEM WHICH MAY ARISE IN THE APPLICATION OF THE REQUIREMENTS OF BS/A.R.P. 37 TO EXISTING LIGHTING INSTALLATIONS.

Use **MAZDA** LAMPS

25 WATTS for all mounting heights with normal spacing.
15 WATTS for 10' 0" mounting height with spacing of less than 100 feet.

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Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 7, January, 1940.)

II.—PHOTOMETRY.

37. Filter and Screen Adapt Light Meter.

Anon. *El. World*, 112, p. 1,893, December 30, 1939.

A filter and fluorescent screen combination may be used to adapt the ordinary light meter for the measurement of ultra-violet radiation. A description of such a device is given.

S. S. B.

38. A Four-Year Record of Ultra-violet Energy in Daylight.

Matthew Luckiesh, A. H. Taylor, and G. P. Kerr.

Frank. Inst. J., 228, p. 425, October, 1939.

This short article is supplementary to an earlier one by the same authors, reporting measurements over a two-year period. The additional data now available strengthen some of the earlier conclusions, and a number of general points resulting from this work are tabulated. One unexpected and interesting result was that with a clear sky as much erythema radiation comes from the sky as from the sun direct, so exposure to the sky alone can produce sunburn under suitable conditions.

S. S. B.

39. Sensitometry of Photographic Papers.

Lloyd A. Jones and C. A. Morrison. Frank. Inst. J., 228, pp. 455, 605, and 755, October, November, and December, 1939.

The authors discuss in some detail constants which may be used to specify the characteristics of photographic material. The apparatus used is described and the whole question considered very fully.

S. S. B.

III.—SOURCES OF LIGHT.

40. Luminous Discharge Lamps.

C. C. Paterson. *Elect.*, 124, p. 63, January 26, 1940.

Progress in lamp development during 1939 is described. Such lamps include the "compact source" type and also fluorescent and "black glass" lamps. Work is now in hand on mains voltage tubular fluorescent lamps.

C. A. M.

41. A Test of Strength.

Anon. *Magazine of Light*, VIII., No. 8, p. 27, December, 1939.

A reference is made to the special use of two 1,000-watt hard glass tungsten lamps burning in the boiler of a steam locomotive at a steam temperature of 450° F. and a pressure of 230 pounds.

C. A. M.

42. Midget Photoflash Lamp.

Anon. *Elect. Engineering*, 59, p. 11, January, 1940.

A brief description and photograph are given of a new photoflash lamp of small dimensions. Despite its small size, a peak flash of nearly a million lumens is claimed.

S. S. B.

IV.—LIGHTING EQUIPMENT.

43. Light Control.

R. F. Cissell, C. L. Amick. *Magazine of Light*, VIII., No. 8, pp. 31-38, December, 1939.

A detailed study is made of the performance of numerous types of reflecting and refracting media, with diagrams giving performance with change of focus of reflector contours and lenses.

C. A. M.

44. Approved Street Lighting Fittings.

Anon. *El. Rev.*, Vol. cxxvi., No. 3,244, p. 106.

Describes, with photographs, new street lighting fittings to comply with BS/ARP/37.

R. G. H.

45. Fluorescent Lighting.

Anon. *Elect.*, 124, p. 80, January 26, 1940.

A brief description with a photograph is given of a small housing for a U.V. lamp for the purpose of activating objects coated with fluorescent dyes, etc.

C. A. M.

46. This Matter of Fluorescent Power Factor.

Ward Harrison. *El. World*, 112, p. 1747, December 16, 1939.

The question of power factor with regard to the fluorescent tubular lamps is discussed, with particular reference to a new twin-ballast arrangement which is available for use with the longer lamps. As the long lamp is more efficient than the

short, it is considered that it will probably become the most general form, and difficulty with power-factor problems will disappear. The twin-ballast device is claimed to have an additional advantage in the suppression of flicker.

S. S. B.

47. Reflector Surfaces for Infra-Red Lamps.

Eugene R. D'Olive. *El. World*, 112, p. 1890, December 30, 1939.

The results of tests on reflectors for use with infra-red lamps are given and some general conclusions are drawn. Gold plating was found to give the best results, but processed aluminium was found to be good. The effect of size of reflector is also considered.

S. S. B.

48. Polarised Light for Motor Vehicles.

Henry T. Gibbs. Frank. Inst. J., 228, p. 719, December, 1939.

A description is given and the results tabulated of experiments made to determine quantitatively the effect on seeing conditions of change of candle power over a wide range, both with and without polarisation of the light. The effect of change in reflection factor of road surface and of object was also investigated, and the result of equipping present cars with polarising material without increase in lamp size considered.

S. S. B.

49. A.R.P. Lighting.

Anon. *Elect.*, 124, p. 47, January 19, 1940.

A brief description with a photograph is given of a portable handlamp of special design suspended from the person of a pedestrian and directed vertically downwards.

C. A. M.

V.—APPLICATIONS OF LIGHT.

50. Report of the Studio Lighting Committee (Society of Motion Picture Engineers).

J. Soc. Mot. Pict. Eng., Vol. xxxiv., p. 94, January, 1940.

Describes a system of lighting and exposure-time co-ordination which is called "key-lighting." The lighting of the dramatically important features of a scene is correlated to the characteristic exposure curve of the negative stock in such a way that the key light exposure density lies midway between the under- and the over-exposure portions of the curve.

R. G. H.

51. A Modern Furniture Store.

H. W. Howard. *Magazine of Light*, VIII., No. 8, pp. 20-22, December, 1939.

Details with photographs are given of the use of fluorescent tubular lamps in the lighting equipment of a furniture store in America.

C. A. M.

52. Fluorescent Lamps Illuminate Windowless Factory.

Gifford K. Simonds. *El. World*, 112, p. 1744, December 16, 1939.

A very large installation of fluorescent tubular discharge lamp in an American steel company is described. The building is windowless. The lamps are 100-watt type, mounted in pairs, and provide an illumination of 20 ft.c. The colour of the light is said to be very pleasing.

S. S. B.

53. A.R.P. Street Lighting.

Anon. *Elect.*, 124, p. 10, January 5, 1940.

A summary is given of the B.S.I. specification for street lighting under war-time conditions, together with an abstract of the conditions of the issue of a licence to manufacture fittings for this purpose. Details with a photograph are given of a typical fitting.

C. A. M.

54. Street Lighting in France.

Anon. *Elect.*, 124, p. 19, January 12, 1940.

A brief description is given of the centralised control of the street lighting in Paris. Impulses of audio-frequency are used. Lamps wattages have been reduced. A description with diagrams is also given of a fitting specially designed to give low illumination values in yards and other open spaces.

C. A. M.

55. Winter Sports Under Lights.

R. J. Swackhamer. *Magazine of Light*, VIII., No. 8, pp. 24-27, December, 1939.

The successful floodlighting of outdoor winter sports is described with numerous photographs and diagrams.

C. A. M.



Workpeople, particularly those operating intricate machinery or using microscopic measurements, can only give of their best under adequate lighting. This is appreciated by lighting engineers, but it has raised a most harassing problem in many industrial plants since the introduction of the "black-out." Crompton lighting experts have made a special study of this new angle on lighting. They have been called in to co-operate on numerous occasions, and

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Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 512,988. "Improvements in and Relating to Vehicle Head Lamps."

*The British Thomson-Houston Company, Ltd.
Dated March 23, 1937. (Convention, U.S.A.)*

This specification deals with a "sealed head light" device, giving details of lens-constructions to produce a so-called "country meeting" beam. The reflector to which the lens is sealed is of paraboloidal shape. The light source itself is a bare filament horizontally disposed and fixed solidly inside—its terminals sealed through the reflector before connection. The axis of the whole lamp is inclined by about $3\frac{1}{2}^\circ$ below the horizontal and 5° out of the vertical to the near side of the road. The control of distribution is effected by fluting of different shapes, in different areas of the lens, the fluting being provided on the inner side. This use of refraction is such as to prevent any appreciable light being thrown towards the oncoming vehicle or above the horizontal.

No. 512,993. "Improvements in or Relating to Anti-Dazzle Devices."

Martinek, A. (U.S.A.) Dated March 26, 1938.

The specification deals with a device, particularly for use by vehicle drivers to offset glare from oncoming headlamps, by means of two or three small-sized screens of opaque material, fixed in a suitable position some distance from the driver's eye. The object is to shield the driver's eyes against the actual glare-giving light source (head lamps of oncoming car), but to leave free the field of vision. To ensure that proper shielding is effected with varying distances from the oncoming car these screens should either be movable (hand operated) or should be so situated as to protect the driver's eyes from the oncoming head lamps up to a very close distance.

No. 513,009. "Improvements in and Relating to Indicating Devices for Push Buttons or the Like."

Pye, Ltd., and Meyer Butler, C. E. Dated March 29, 1938.

The specification deals with a push button switch, the working position of which is indicated by means of a lighting effect. The actual push button consists of two cylindrical parts secured to each other on the same axis with a washer in between, the top part being of translucent material, whereas the bottom part is opaque. The lamp located inside the housing throws its light on the button, but is prevented from penetrating through the buttonhole by means of the washer which rests against the wall of the housing. When the button is depressed light is permitted to penetrate through the translucent upper portion.

No. 513,025. "Improvements in Gas-Tight Seals wherein Electric Conductors Pass Through Quartz or like Vitreous Material."

The General Electric Company, Ltd., and Schmetzler, K. G. Dated March 23, 1938.

Quartz has a very low thermal expansion and there is accordingly difficulty in sealing in conductors of tungsten unless of very small diameter. One

device for overcoming this difficulty is to embed the conductor, forming a gas-tight junction, in a strip of metal (molybdenum) not exceeding .02 mm. in thickness to the extremities of which stouter conductors are attached. The sectional area of the strip determines the maximum amount of current that can pass without destroying the seal (10 amp.). It is the object of this invention to increase this amount without modifying the method of thin joints. A method put forward provides for a thin circular disc of molybdenum, 30 mm. dia. and .015 mm. thick, with conductors (molybdenum strips) to be soldered on either side. The conductors run through quartz tubing of 4 mm. dia. flanged on the sides facing each other. These flanges are then joined (with the disc in between them), heated until gas-tight, the region round the disc evacuated, and the joint sealed by the quartz collapsing on to the disc. In soldering the conductors it is recommended that their tops be nickel plated.

No. 513,054. "Improvements in or Relating to Electric Tumbler Switches."

George H. Scholes and Company, Ltd., Scholes, H. G., and Pearce, F. J. Dated December 24, 1937.

The construction of switch at present in use, in general provides for the contact-making part to be mounted on a fixed pivot and actuated by a spring which, by operation of the "doll," effects a snap action pivoting engagement or disengagement of the movable contact with or from the stationary contacts. The improved construction provides for the movable contact to be loose and adapted to "float" or slide. This "floating" part rests on a spring and in the "on" position of the "doll" is pressed against the stationary contacts.

No. 513,086. "Improvements in Luminous Number Plates and other Luminous Signs."

McKnight, W. C. Dated March 31, 1938.

The luminous sign according to the specification consists of a thin metal plate covered with designs, letters, numbers, etc. The area between the margins of such designs is perforated with a multitude of holes not materially larger in diameter than the thickness of the plate. A number of lamps located in a cavity behind the plate direct their light on a reflector which serves as a background to the actual sign plate.

The Paris International Trade Fair

We learn that the above Fair (the thirty-second in the series) is to take place in Paris during May 11-27. Sections have been promised by a number of countries, and the usual Inventions Competition (with prizes to the value of 25,000 francs) will be arranged. Persons desiring to compete or exhibit should communicate with the London Office at 17, Tothill-street, Westminster. One is glad to notice that in spite of warfare this event is being maintained. It has, of course, a special interest at the present time when the Franco-British understanding in regard to economic matters is being so closely developed.

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War Time Street Lighting Demonstrations in Westminster

An enterprising departure was the organisation, on February 6, 7, and 8, of a series of meetings attended by representatives of local authorities from all parts of the United Kingdom, to inspect the new war time street lighting installed in Westminster. The aggregate audiences on the three evenings, which must have attained over 500, included visitors from localities in England distributed between Newcastle and Devon, as well as remote spots in Scotland and Wales.

On each evening the visitors assembled in the Empire Restaurant (near Victoria Station) and the same programme was followed. An initial address was given by Mr. Percy Good, Chairman of the Joint Lighting Committee (on which the Department of Home Security (A.R.P. Dept.), the Illuminating Engineering Society, and the Association of Public Lighting Engineers are represented). Subsequently, Mr. F. C. Johnson (Under-Secretary of State at the Home Office) and Mr. F. C. Smith (President of the I.E.S.) made a few remarks, and Mr. J. M. Waldram repeated his lantern demonstrations illustrating degrees of visibility from the air of street lighting. After receiving a few hints from Mr. C. I. Winstone, visitors were then marshalled in groups which set off in turn for a circular tour of adjacent streets, after which they re-assembled for a final discussion.

ADDRESSES AND DEMONSTRATIONS.

The various addresses together gave a good general impression of the preparatory work on which these new street lighting units are based. It was explained how tests of a series of experimental installations, aided by aerial observations, had established the belief that this low degree of illumination (of the order of 0.00025 foot-candles) was near the limit that could safely be provided for continuous general illumination without danger of revealing too much to hostile aircraft. It was then pointed out that the only certain and practical way of securing and maintaining this condition was by means of approved fittings of the type covered by the specification and installed under correct conditions as regards mounting height and spacing.

VISIBILITY FROM ABOVE.

Mr. Waldram's ingenious method of experiment, which goes a long way towards enabling one to predict the appearance of illuminated areas as seen from above, has afforded confirmatory evidence of the above view. This method of experiment consists in superimposing on a screen images from two adjacent optical lanterns. One can thus represent the appearance of a network of streets lighted to varying degrees of brightness, and can then see how the impression alters according as the area receives no natural light, starlight or moonlight, of varying intensity. Placards, with numbering inscribed in phosphorescent paint, situated at calculated distances from the screen, enabled the audience to judge the appearance at heights of observation from 2,000 ft. upwards. Meantime, in an adjacent room, specimens of approved types of street lighting fittings and standard A.R.P. signs were on view.

CIRCULAR TOUR OF THE STREETS.

The initial part of the programme, in short, was well designed to impress members of the audience with an appreciation of the skill and care devoted to the development of this system of street lighting. The tour of adjacent streets, on routes carefully selected by Mr. Winstone and Mr. M. E. Pyser to show gas and electric lighting under different conditions of mounting height and spacing, was also

convincing. In the wider streets, with a fair amount of traffic, the effect of the special lighting was naturally masked to some extent by the presence of headlights, torches, etc. But in the narrow streets, receiving practically no light from the overhead sky, and none at all from headlights, shop windows, etc., its value was manifest. To the dark-adapted eye approaching persons, obstacles, and kerbs were definitely, if dimly, revealed—a great contrast to complete obscurity as was shown when, for the benefit of visitors, certain regions were temporarily plunged into complete darkness.

BENEFITS RECOGNISED.

When visitors reassembled for discussion (after a short interval for refreshments and examination of exhibits) there was general testimony as to the utility of the "synthetic starlight," both as an amenity under present conditions and as of inestimable value in the event of air raids—when all supplementary lighting from traffic lights, headlights, and shop windows would disappear, and even torches are not intended to be used.

The arrangements for the meetings were excellently devised. Apart from the speeches and the invaluable demonstrations by Mr. Waldram and his assistants, the arrangements devised by Mr. Winstone and Mr. Pyser and their troop of guides (each with his phosphorescent hatband) worked admirably. Thanks are due to those firms who, under Mr. Ackerley's supervision, arranged a useful display of apparatus at very short notice.

In conclusion, the rapid mobilisation of the united efforts of the Illuminating Engineering Society and the Association of Public Lighting Engineers may be noted as a happy feature of the occasion.

Obituary

Colonel R. E. B. Crompton

By the death of Colonel R. E. B. Crompton, who passed away on February 15 at the great age of ninety-four years, the electrical industry has lost one of its great figures. If ever there was a case in which a man's deeds entitled him to rank as "one of the legendary figures of the great past" here is one.

Colonel Crompton's long life was packed with incidents, enterprises, and achievements such as rarely fall to the lot of a single man. Could one find in the memory of any living person two such incidents as his witnessing the Great Exhibition in Hyde Park (at the age of six) and serving in the trenches of the Crimea as a cadet (at the age of eleven)? As evidence of longevity this is hard to beat. But apart from the span of years the versatility, vigour, and physical fitness which he displayed for the greater part of his life were most remarkable.

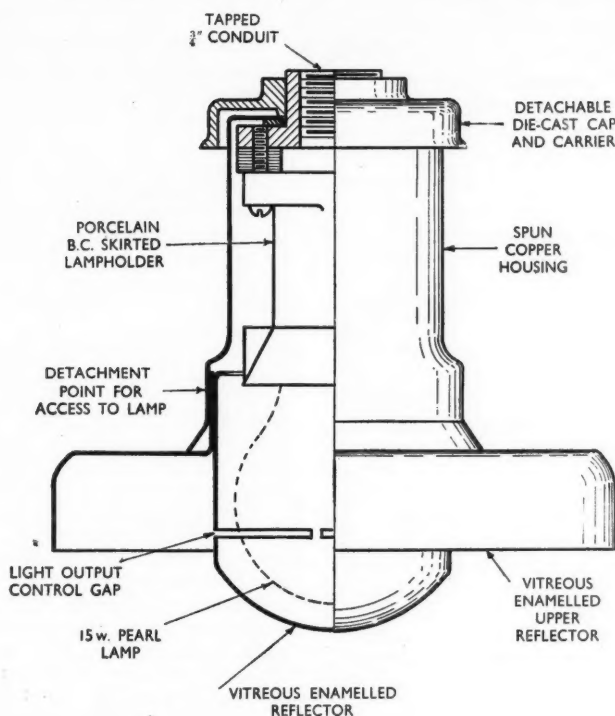
His early interests were mechanical (he was a pioneer in road transport), but it was in electrical engineering he found his real field. He was associated with the earliest electric lighting enterprises, installing electric lighting at the Mansion House, Buckingham Palace (where it is said he fell out with Queen Victoria on the subject of "concealed lighting" of the modern type), and the Law Courts. He introduced electric lighting into the Ring Theatre in Vienna. His early work on the arc lamp was followed by researches on generators and at his works many of the earliest dynamos were manufactured.

In early life in the Indian Army he served again in the Boer War in charge of a corps of electrical engineers and in the Great War his advice was sought on many problems, including the development of "tanks."

Colonel Crompton was the founder of R. E. Crompton and Company and a director of Crompton Parkinson, Ltd. On his ninetieth birthday, in 1935, a banquet was given in his honour by the presidents of the five chief scientific societies. It was in keeping that the period of his happy married life was almost equally enduring. It was only in November last that the partnership was severed by the death of Mrs. Crompton, after an ideal union which lasted for more than sixty-eight years.

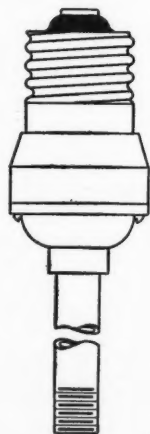
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NOTES ON ILLUMINATING ENGINEERING ABROAD

(Specially Contributed—H. L. J.)

Belgium

"Le Bulletin de l'Association Belge des Electriciens" describes *in extenso* the magnificent fountain installation arranged at the Liège Exhibition last autumn. Attention is drawn to two special features. The first is the so-called "Tunnel of Water," about 20 yards in length, through which visitors passed by motor boat. The tunnel was actually formed by arranged discharge tubes as an archway, the light points being located in water basins on both sides, placed in front of approximately 400 jets which formed a wall of water behind them. Three hundred 500-w. lamps, equipped with colour-filters, illuminated the wall of water. The second item of interest was a fountain casting its water 125 yards in the air, working either on a single jet or as a combined spray of eight jets. The fountain was placed on a small pontoon—38 by 5 metres—anchored in the Antwerp-Liège Canal. In addition to the centre jets, 200 others, by casting atomised water round about it, masked the shape of the boat. This mass of water was illuminated by 232 200-w. lamps. Illumination of the centre of the mountain was effected by silver glass alzak finished reflectors covered by safety glass approximately 14 mm. thick. The reflectors contained parabolic mirrors approximately 80 cm. diameter. The safety glass had to be provided to avoid cracking, owing to the extreme heat of the lamps and the danger of drops of cold water falling on the glass. The pumps feeding the centre fountain had a capacity of 800 h.p., and the consumption of water per hour, while the mountain was working, was 1,750 cm.

U.S.A.

The Chicago offices of the Pullman-Standard Car Company have been reorganised and partly rebuilt. The "Engineering News Record," in describing the features of the new offices, devotes much space to the lighting scheme of the central drafting room. The room houses 200 draughtsmen and has an area of 125 ft. by 163 ft. Its roof is of concrete, and was furnished with sawtooth glass roofing, with a view to affording adequate illumination by daylight. Investigations into existing installations proved, however, that such glass roofing did not work satisfactorily for this purpose, the main drawbacks being the development of leaks in the roof and condensation drip causing damage to the drawings. Furthermore, the case of exceptionally large tracings, variations in humidity, caused troublesome expansion and contraction of the tracing vellum. These considerations led finally to a decision in favour of artificial lighting. This arrangement, however, made it necessary to install forced ventilation in order to dissipate the heat from the numerous light sources and to provide air treatment to keep humidity under control. The room is cut by central supports into two clear working areas of 54 ft. by 163 ft., and the ceiling intersected with T-beams, 24 ft. apart. The whole ceiling and the walls are plastered to obtain flat surfaces with proper texture and better light reflecting values. Every second cross beam contains an air duct. The short spacing of the beams has a beneficial influence on the limitation of the ceiling glare. The lighting fixtures chosen are of the totally indirect alzak finished, bowl type. The illumination on the desks is of the order of approximately 40 ft.c. No local lamps are provided. The whole lighting in-

stallation in conjunction with the ventilation and air treatment provisions is considered one of the finest of its kind in the country.

Italy

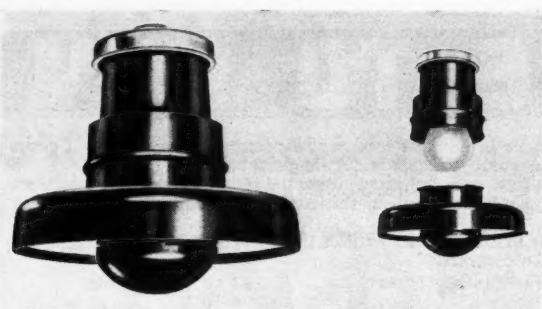
According to "Il Vetro," a street lighting lantern for side mounting has recently been patented and marketed. This makes use of an elliptically shaped fitting for light distribution. The fitting is provided for a mounting height of approximately 25 ft., and has to be suspended at an angle of about 33° to the vertical, units being spaced about 100 ft. apart. The fitting utilises a tungsten lamp in the centre of a silver glass reflector, elliptical in section, and closed at the bottom with satin finished glass. Two beams of reflected light are emitted, one from each side, with the main candlepower located in a cone of 63° to the vertical.

Australia

The growing recognition of the Illuminating Engineering Society (N.S.W.) is enjoying among authorities and professional sister organisations was well demonstrated at the annual dinner held in December last. The official guests included Councillor Harding of the Sydney County Council, the President of the Standards Association of Australia, the Superintendent of Technical Education and the Presidents of the Institute of Optometrists and the Australian Institute of Architects (N.S.W.). The Society is now permanently represented on two bodies belonging to the Sydney Technical College, i.e., the Electrical Trades Advisory Committee and Public Health and Hygiene, and on two sections of the Standards Association: the Street Lighting Committee, Interior Illumination of Buildings, and finally on the Road Safety and Transport Conferences.

Switzerland

The "Bulletin de l'Association Suisse des Electriciens" describes the features of a foot-candle recording apparatus which enabled visitors to the Swiss National Exhibition in Zurich last year to find for themselves the individual optimum intensity for reading purposes. Many of the devices hitherto used, it is contended, have drawbacks of a psychological nature. Either the intensity of the light is varied by means of varying the voltage, which has the undesirable effect of changing the spectral composition of the light or an unnatural angle of vision, which may lead to wrong readings, is adopted during observations. The Swiss apparatus consists of a 200-w. lamp, frosted, in a silver glass reflector housed in a rectangular metal casing. This casing contains on the bottom part a number of opaque shutter strips which revolve parallel to each other and can be operated from underneath by the observer. In the "closed" position they overlap each other, shutting off the light completely. This system is thus elastic, enabling the illumination to be varied within wide limits without any colour change. Besides the usual apparatus to mark the illumination selected on a ticket to be taken by the observer, a recording apparatus was attached. This marked each observation taken on a separate strip of paper simultaneously by means of punching. Two hundred thousand observations were thus recorded on 200 metres of paper strip. The results of all observations taken during the Zurich exhibition, thus preserved, are now being investigated and exploited by the societies interested.



We illustrate above the low intensity street lighting fitting produced by the Edison Swan Electric Co., Ltd., to which reference was made in our January issue (p.15). This utilises a 15-w. pearl lamp and two reflectors with an accurate light gap to secure the desired distribution.

The Illuminating Engineering Society (U.S.A.)

Notes on Transactions (January, 1940)

REMARK: This month's issue represents the first number of the Journal "Illuminating Engineering" which contains in addition to papers, recorded as hitherto in the Transactions, original contributions on different lighting subjects. The cover shows a photograph of an outstanding installation which will change with each issue. The size of page and general arrangement of contents remain substantially the same.

NEWS: This year's Convention of the Society will be held at Spring Lake, N.J., from September 9-12 incl. The New England Section, I.E.S., in conjunction with the Massachusetts State Association of Master Electricians, recently arranged a lecture course on *Lighting for contractors*, etc., in their area, at the end of which each participant received a certificate. The success was so great that other I.E.S. sections intend to arrange for similar courses. "Stump the experts" was the theme of an informal I.E.S. meeting in Philadelphia. Prizes were offered to anyone submitting a question which really stumped them.—The RLM Standards Institute, dealing with the development of standard specifications for lighting equipment, has issued a *Specification for a new 48-inch Fluorescent Twin Lamp Porcelain Enamel Unit*.

CONTRIBUTIONS: A *Summary of Researches Involving Blink-Rate as a Criterion of Ease of Seeing* by M. Luckiesh and F. K. Moss. In an endeavour to find a "yardstick" for the comfort created by the illumination in a seeing task, the theory has been investigated experimentally that the blink-rate of the eyelids is related to the degree of tension or

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strain during the performance of a critical visual task. The reading of 6-point type compared with 12-point type necessitates a blinking rate of 148 compared with 100. The influence of glare was proved; subjects reading at a blinking rate of 100 showed an increase to 158 as seen as a 50w. frosted lamp was put 20 deg. above the line of vision in 1 meter distance. In total seventeen different researches have been made, and it was conclusively shown that the rate of blinking invariably increased as the task was, in various ways, made more difficult.

The Year's Progress in Illumination, 1938-1939. I.E.S. Committee. The usual survey is given dealing with last year's development in Light Sources and Lighting Applications. Among the light sources the most important are certainly the Fluorescent and the "Sealed Beam" Car Head Lamps. In the field of Research mention is made of the efforts of Dr. K. Blodgett and Dr. J. W. Strong to reduce the reflection factor of clear glass by utilising light wave interference.

A Street Lighting Evaluator, by K. M. Reid and H. J. Chanon. The apparatus consists in its essential parts of a pavement bed fitted with a strip of "simulated" pavement mounted over the hood of the "Laboratory" car, a glare integrator mounted above the windshield, and a photometric control box on the seat beside the operator. The Evaluator serves for the quick measuring and recording of the pavement brightness for given points in the street, or of the brightness of representative obstacles on and near the roadway and the glare from sources in the field of view. Only a single operator is required.

Effective Street Lighting Must be Planned, by S. R. Williams. There are many factors involved in providing adequate lighting in an entire community at costs which that community can afford to pay. The term "planning," in its true sense, includes consideration of every one of these factors. On this basis the author discusses the planning of a town-lighting installation.

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N.B.—The numbers are those attached to individual entries in the Directory (See pp. 34—36)

Wardle A.R.P. Street Lighting Unit

We illustrate below an addition to the series of A.R.P. street lighting units available, that produced by the Wardle Engineering Co., Ltd., and now being manufactured under



the B.S.I. licence No. 308. The lantern is designed for mounting at 20 feet, and is equipped with a 25-watt pearl lamp. The illustration shows a fitting with a Goliath to B.C. adaptor. Adaptors E.S. to B.C. and B.C. to B.C. can also be supplied.

Lighting for Vision

A new departure is made in the booklet entitled "Lighting and Vision," issued by Benjamin Electric, Ltd. It has all the marks of originality and is something quite unusual in lighting literature. To begin with, the matter is set in large type with big margins and on mat glazeless paper—withstanding the fact that half-tone illustrations are largely used. In addition—whilst the fundamental facts in connection with lighting are, of course, familiar—the method of presentation is novel. The very first sentence, "We cannot see light," is provocative. The subsequent presentation of "Basic Facts of Lighting," "The Ingredients of Good Lighting," etc., leads up to a summary of the requirements in the Factory Act, followed by summaries of the advantages of good lighting from the standpoint of the worker and the executive. The various Benjamin specialties, such as the Saafux system of reflect or construction, are, of course, illustrated. What strikes us as perhaps the most ingenious device of all is the "Survey of Jobs," which is, in effect, an illustrated code of lighting. Over a hundred processes, ranging from "Aerograph—Assembly" to "Wrapping and Boxing," are named and illustrated, and beneath each picture is a brief statement of lighting requirements and the recommended illumination in foot-candles. The booklet concludes with a reference to Benjamin service.

New Shadow-free Lighting Fitting

For the local illumination of assembly and other fine benchwork, drawing-boards, surgical and nursing work, etc., the chief requirement is a fitting that will give a concentrated light, free from hard shadows, from a lamp of relatively low wattage. These conditions are fulfilled by an entirely new design of G.E.C. lighting fitting.

The reflector, constructed of anodised aluminium, is semi-circular and fitted with holders to take a standard 6½-in. radius 60-watt half-circle Osram architectural lamp, 30 mm. dia. The fitting can be either permanently mounted or fitted with a handle allowing it to be used as a portable handlamp as shown.



G.E.C. Shadow-free Lighting Fitting used as a portable handlamp for ophthalmological and surgical purposes.

Catalogues and Literature Received

- BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION and E.L.M.A. LIGHTING SERVICE BUREAU.—"Modern Factory Lighting," a useful handbook in which special reference is made to wartime requirements.
- BRITISH THOMSON-HOUSTON, Co., LTD.—Leaflets illustrating new B.T.H. A.R.P. street lighting lantern and Mazdalux internally illuminated A.R.P. location and direction signs.
- LE CARBONE, LTD.—Catalogue of "A.D." wet and dry cells, and leaflet describing A.R.P. portable battery lamp.
- ELECTRIC LAMP MANUFACTURERS' ASSOCIATION.—Particulars of new prices for electric discharge lamps, operating from February 1 onwards.
- HOLOPHANE, LTD.—Leaflet describing the new Holophane A.R.P. street lighting unit; also catalogue featuring Holophane Controllens system for the lighting of hospital operating theatres.
- LAMP SHADES AND STANDARDS MANUFACTURERS' ASSOCIATION.—Particulars of Lamp and Shade Fair (Berners Hotel, London) for February 19-23.
- PARIS INTERNATIONAL TRADE FAIR.—Notice of the Fair, to take place during May 11-27. Office for Great Britain, 17, Tothill-street, London, S.W.1.

